

Scientific Notation

Reporting Category Number and Number Sense

Topic Ordering numbers written in scientific notation

Primary SOL 7.1 The student will
b) determine scientific notation for numbers greater than zero;
c) compare and order fractions, decimals, percents, and numbers written in scientific notation.

Related SOL 7.1a

Materials

- Scissors
- Graphic Organizers (attached)
- Standard Form Cards (attached)
- Scientific Notation with the Solar System activity sheet (attached)

Vocabulary

factor, product, standard form, exponent, least, greatest (earlier grades)

scientific notation (7.1)

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Display several very large numbers in standard form. Give these numbers some context, such as population, gallons of water in a river, or the amount of money a celebrity paid for a house. Lead a discussion about why it could be difficult to rewrite these numbers correctly. Then, write the numbers in scientific notation, and use this to introduce scientific notation. Ask students to brainstorm what steps were taken to change the number from standard form to scientific notation.
2. Demonstrate how to write a number using scientific notation. The graphic organizer can be used to assist the demonstration. Explain that scientific notation is the product of two factors. One factor is a decimal greater than or equal to 1 but less than 10. The other factor is a power of 10. Give students some examples and ask them to identify examples and non-examples. Ask students to explain why the non-examples are incorrect. Give students some numbers, and ask them to write each number using scientific notation.
3. Give each student a Standard Forms Card sheet. Ask them to cut apart the cards and arrange them by the standard form, in order from largest to smallest. Have students write, at the bottom of each card, the number in scientific notation.
4. Once the cards are arranged in correct order, ask students what patterns they see in the arrangement of the scientific notation. The discussion should focus on the fact that the numbers with the smallest exponents are the smallest in value. The numbers are then arranged by the decimal factor.
5. Distribute copies of the Scientific Notation with the Solar System activity sheet, and have students complete it.

6. Using the board, an interactive whiteboard or overhead projector, write several very small numbers in standard form. These numbers should be in context, such as size of a strand of hair, size of a blood cell, etc. Lead a discussion about why this number could be difficult to rewrite correctly. Write the number using scientific notation. Use this to introduce scientific notation. Ask students to identify the steps taken to change the number from standard form to scientific notation.
7. Give each student a Standard Forms Card Part 2 sheet. Ask them to cut apart the cards and arrange them by the standard form in order from largest to smallest. At the bottom of each card write the number in scientific notation.
8. Once the cards are arranged in correct order, ask students to identify the patterns they see in the arrangement of the scientific notation. The discussion should focus on the fact that the numbers with the smallest exponents are the smallest in value. The numbers are then arranged by the decimal factor.

Assessment

- **Questions**
 - Why would you want to write a number in scientific notation?
 - When ordering numbers written in scientific notation, what is the first step?
- **Journal/Writing Prompts**
 - Write the steps for converting a number in standard form to a number in scientific notation.
 - Explain how to order numbers written in scientific notation.
- **Other**
 - Use the second graphic organizer (i.e., with the empty descriptors). Have students use the vocabulary to create their own problem.

Extensions and Connections (for all students)

- Have students design a Scientific Notation Poster. The poster should include an explanation on how to convert a number from standard form to scientific notation with at least two examples. It should also include an explanation about ordering numbers written in scientific notation with at least two examples.
- Write the mass of the planets using scientific notation.
- Use the Standards Form Cards as a partner activity. One partner completes the left column, and the other partner completes the right. Partners then check one another's work and discuss.

Strategies for Differentiation

- When identifying examples and non-examples, give students cards on their desks to sort.
- Some students will need extra reinforcement with the greater-than and less-than symbols.

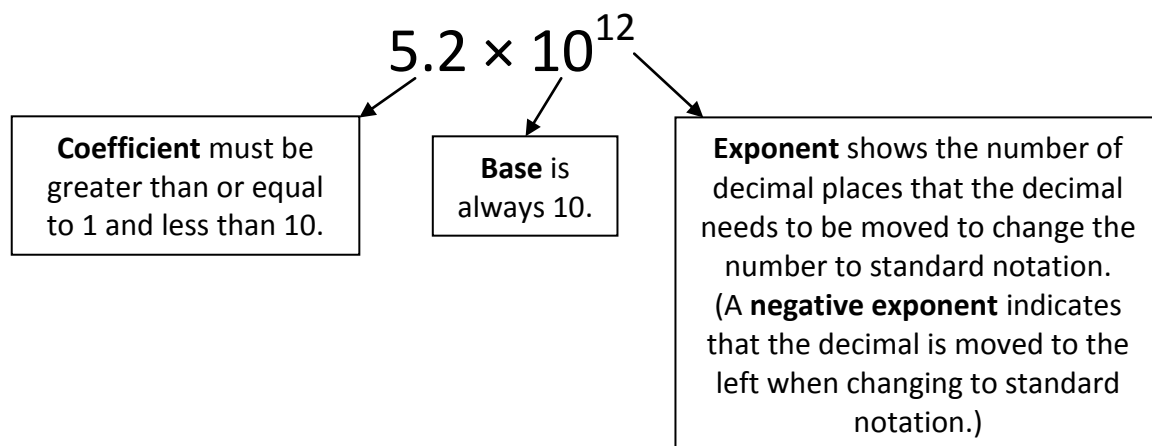
Graphic Organizer

Numbers can be written in standard form and in scientific notation.

Standard Form: 5,200,000,000,000

Scientific Notation: 5.2×10^{12}

Numbers written in scientific notation are made up of three parts: the coefficient, the base, and the exponent.



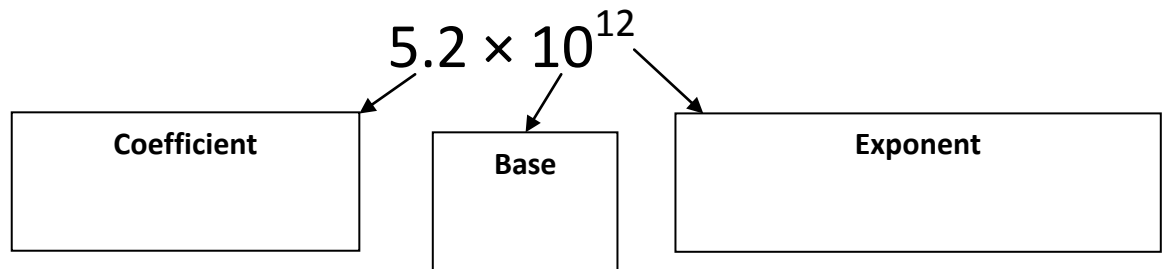
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Standard Form Cards

1,200,000,000	11,900,000
9,800,000	203,000,000,000
80,000,000	60,510,000
27,000,000,000	1,050,000,000
0.000003	0.00000612
0.000054	0.00000036
0.0000409	0.00006296
0.0000000367	0.00000067

Scientific Notation with the Solar System

Name _____ Date _____

Complete the chart.

Planet	Approximate distance from the Sun	Distance written in scientific notation
Earth	93,000,000	
Jupiter	484,000,000	
Mars	142,000,000	
Mercury	36,300,000	
Neptune	2,800,000,000	
Saturn	888,000,000	
Uranus	1,780,000,000	
Venus	67,200,000	

List the planets in order from **greatest to least**, using scientific notation.

Planet	Distance from the Sun written in scientific notation